

- (e) a plurality of linker moieties in contact with the porous, polymeric pads at the test sites,
- (f) a plurality of probe molecules immobilized to the linker moieties, wherein said probe molecules specifically bind to or interact with target molecules,
- (g) a signal generator for producing an electrical signal at each input electrode,
- (h) a detector for detecting changes in the electrical signal at each output electrode, and
- (i) an electrolyte solution in contact with the porous polymeric pads, input electrodes, output electrodes, linker moieties, and probe molecules, wherein molecular interactions between the immobilized probe molecules and target molecules are detected as a difference in the electrical signal detected at each output electrode in the presence and absence of target molecules.

2. (Amended) An apparatus for electrical or electrochemical detection of molecular interactions between immobilized probe molecules and target molecules in a sample solution, comprising:

- Sub 1
- (a) a supporting substrate comprising an array of test sites,
 - (b) a plurality of porous, polymeric pads in contact with the supporting substrate at the test sites,
 - (c) a set of input electrodes in contact with the plurality of porous, polymeric pads at the test sites, wherein each input electrode is arranged such that a first portion of the input electrode is in contact with a test site and a second portion of the input electrode is in contact with a different test site,
 - (d) a set of output electrodes in contact with the plurality of porous, polymeric pads at the test sites, wherein each output electrode is arranged such that a first portion of the output electrode is in contact with a test site and a second portion of the output electrode is in contact with a different test site, and wherein each output electrode is in electrochemical contact with an input electrode,
 - (e) a plurality of linker moieties in contact with the porous, polymeric pads at the test sites,
 - (f) a plurality of probe molecules immobilized to the linker moieties, wherein said probe molecules specifically bind to or interact with target molecules,
 - (g) at least one reference electrode in electrochemical contact with the input and output electrodes,
 - (h) a signal generator for producing an electrical signal at each input electrode,
 - (i) a detector for detecting changes in the electrical signal at each output electrode, and
 - (j) an electrolyte solution in contact with the porous polymeric pads, input electrodes, output electrodes, linker moieties, reference electrode, and probe molecules, wherein molecular interactions between the immobilized probe molecules and target molecules are detected as a difference in the electrical signal detected at each output electrode in the presence and absence of target molecules.

3. (Amended) An apparatus according to claim 1, wherein the output electrodes and input electrodes are interdigitated at the test site.

4. (Amended) An apparatus according to claim 2, wherein the output electrodes and input electrodes are interdigitated at the test site.

64. (Amended) A method for the electrical detection of molecular interactions between a probe molecule immobilized at a specific test site and a target molecule in a sample solution, comprising:

(a) applying a first electrical signal at an input electrode in contact with a first set of porous, polymeric pads, wherein the first set of porous, polymeric pads comprises the porous, polymeric pad at the specific test site,

(b) detecting the first electrical signal at an output electrode in contact with a second set of porous, polymeric pads, wherein the second set of porous, polymeric pads comprises the porous, polymeric pad at the specific test site,

(c) exposing the first and second sets of porous, polymeric pads to a sample mixture containing the target molecule,

(d) applying a second electrical signal at an input electrode in contact with the first set of porous, polymeric pads,

(e) detecting the second electrical signal at an output electrode in contact with the second set of porous, polymeric pads,

(f) comparing the first electrical signal detected in step (b) with the second electrical signal detected in step (e), and

(g) determining whether the first electrical signal is different from the second electrical signal.

65. (Amended) The method of Claim 64, wherein molecular interactions between probe molecules and target molecules are detected by using an electrical or electrochemical detection method selected from the group consisting of impedance spectroscopy, cyclic voltammetry, alternating current (AC) voltammetry, pulse voltammetry, square wave voltammetry, hydrodynamic modulation voltammetry, conductance, potential step method, potentiometric measurements, amperometric measurements, and current step method.

66. (Amended) The method of Claim 64, wherein molecular interactions between probe molecules and target molecules are detected by using an electrical or electrochemical detection method that is alternating current (AC) impedance and the AC impedance is measured over a range of frequencies.

67. (Amended) The method of Claim 64, wherein molecular interactions between probe molecules and target molecules are detected by using an electrical or electrochemical detection method that is alternating current (AC) impedance and the AC impedance is measured by transient methods with AC signal perturbation superimposed upon a direct current (DC) potential applied to an electrochemical cell.

68. (Amended) The method of Claim 64, wherein molecular interactions between probe molecules and target molecules are detected by using an electrical or electrochemical detection method that is alternating current (AC) impedance and the AC impedance is measured by impedance analyzer, lockin amplifier, AC bridge, AC voltammetry, or combinations thereof.

Please add new claims 76-80:

76. (New) The apparatus of claim 1, wherein the input and output electrodes are embedded in the porous, polymeric pads at the test sites.
77. (New) The apparatus of claim 2, wherein the input and output electrodes are embedded in the porous, polymeric pads at the test sites.
78. (New) The apparatus of claim 1, 2, 3, or 4 wherein each test site is uniquely indentified by two electrodes, a first electrode chosen from the set of input electrodes, and a second electrode chosen from the set of input electrodes.
79. (New) The apparatus of claim 78, wherein the array of test sites is x-y addressable in that each electrode in the set of input electrodes defines an x coordinate, and each electrode in the set of output electrodes defines a y coordinate.
80. (New) The apparatus of claim 78, wherein the array of test sites is x-y addressable in that each electrode in the set of output electrodes defines an x coordinate, and each electrode in the set of input electrodes defines a y coordinate.

REMARKS

This Amendment and Response is submitted in response to the Office Action mailed 13 March 2002. Withdrawal of the rejection and reconsideration with an eye toward allowance is respectfully requested. A marked-up version of paragraphs and claims amended as above is attached herein, entitled **Version with Markings to Show Changes Made**. For the Examiner's convenience, a clean copy of all pending claims is attached, entitled "**Appendix A: Pending Claims**".

Support for the above claim amendments can be found throughout the originally filed specification and drawings. For example, support for the amendments to claims 1 and 2 can be found in Figures 1 and 3, and on page 11. Support for new claims 76-80 can be found on page 10, line 28 - page 12, line 8.

Applicants note with appreciation the Examiner's rejoining of Groups I and II into a single group, having found Applicants' arguments traversing the requirement for restriction persuasive.